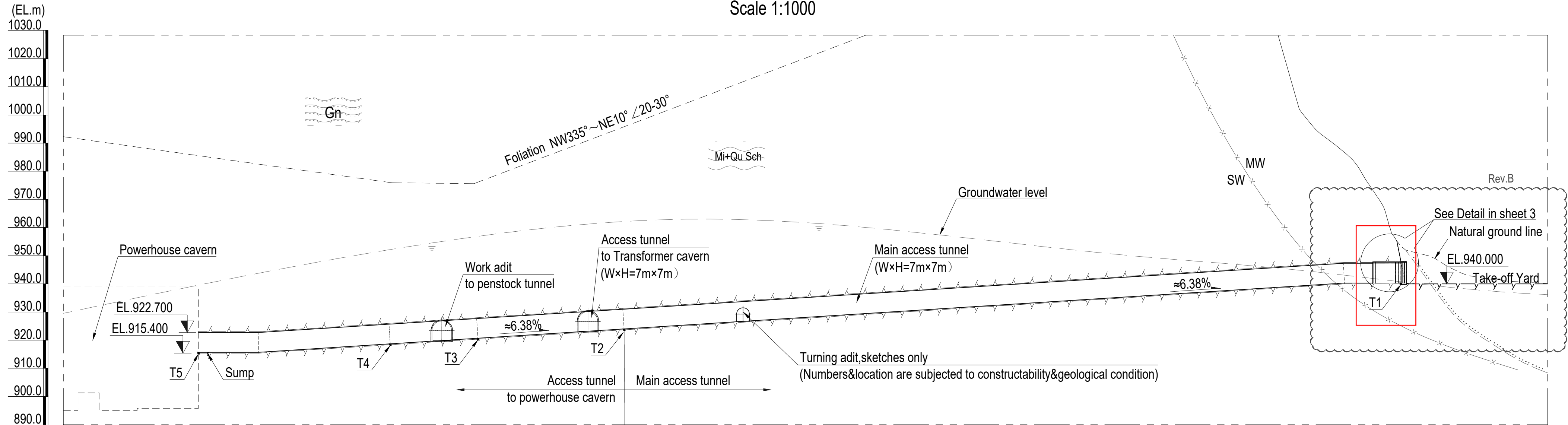


LONGITUDINAL PROFILE OF ACCESS TUNNEL (TO POWERHOUSE CAVERN)

Scale 1:1000



Chainage (m)	CP0+151.143										CH0+020.000									
Vertical alignment	Level 915.400 L=21.367m										Level 940.000 L=20m									
Distance (m)	E.P. 427.016 420 400 380 358.963 340 327.783 320 300 280 275.873 260 240 220 200 180 160 140 120 100 80 60 40 20 00 B.P.																			
Assumed rock classification	II										III									
Support type	Support type of class II										Support type of class III									
Overlying rock thickness	294m ~ 402.8m										7.7m ~ 294m									

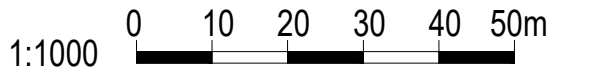
TUNNEL SUPPORT PATTERN

Rock mass quality	40≥Q	10≤Q<40	4≤Q<10	1≤Q<4		Q<1
Support type	I	II	III	IV (Without steel support)	IV (With steel support)	V Same as type IV (With steel support)
Inner dimension(m)	W=7m, H=7m					
	Excavation Parameter					
ESR	1.3	1.3	1.3	1.3		1.3
Excavation span(m)	3	3	2	1.5		0.5~1
Calculated MUS*(m)	11	9	5	3		1
MUS* for shotcrete application(m)		9	2	1.5		1
MUS* for rock dowel installation(m)		6	4	3		0.5~1
MUS* for steel support installation(m)				0.5~1.0		0.5~1
Excavation method	Blasting			Blasting/mechanically		Mechanically
Initial support parameters						
Weep hole Φ50mm,L=0.5m / 0.8m	where necessary					
Plastic fiber shotcrete,f'c=25MPa	T=50mm	T=50mm	T=100mm	T=100mm	T=160mm	For class V rock, the same support scheme as class IV rock can be adopted after grouting is used to improve the integrity and firmness of surrounding rock.
Rock dowel D25,L=3m,alternately	Spot	@2.5m×2.5m	@2m×2m	@1.5m×1.5m	@1.0m×1.0m	
Steel support, MB150 (or lattice girder)					@1m	
Forepoling grouted dowel,D25mm, @400mm, L=6m					where necessary	
*MUS , Maximum Unsupported Span.						

NOTE

- All dimensions are in millimeters, and coordinates, chainages & elevations are in meters.
- The excavation and support methods can be adjusted according to the actual situation after the geological conditions are revealed.
- It is evident that the maximum unsupported span is a guideline, only, and needs continuous adjustment to the prevailing rock conditions and construction requirements at the spot.
- The cylinder specified compressive strength of tunnel shotcrete and cement mortar at 28 days of age is 25MPa.
- The specified compressive strength of concrete is the cylinder strength at age of 28 days.
- The yield strength and of steel is 250MPa.
- Rust preventive compound will be sprayed on exposed surface of steel structure.
- Symbol description:
A-Line is the design excavation line.
B-Line is the overbreak line.
R denotes round bar, yield strength of the round bar is 280MPa.
D denotes deformed bar, yield strength of the deformed bar is 500MPa;
- The forepoling is mainly used in the tunnel section with poor surrounding rock geology, which should be used together with dowel and steel support (or lattice girder), and the spacing of dowel should be consistent with that of steel support.
- The detail of weep holes, rock dowel, steel support and steel lattice girder see the drawing No. UT1-C-000-CVL-DG-40001.
- The end position of the access tunnel may be adjusted according to the final design of the powerhouse.
- The steel support (or lattice girder) to rock class V / IV is subjected to the exposed geological condition.
- See subsequent drawings for concrete structure and reinforcement.

Scale:



REFERENCE DRAWINGS

UT1-C-000-CVL-DG-40001	DETAILED DESIGN DRAWING OF EXCAVATION AND SUPPORT FOR UNDERGROUND CAVERN
UT1-C-090-CVL-DG-64001	SURROUNDING ROCK STABILITY CALCULATION OF ACCESS TUNNEL FOR POWERHOUSE
UT1-C-090-CVL-DG-64001	LAYOUT OF ACCESS TUNNEL TO POWERHOUSE

SYMBOL AND LEGEND

FOR APPROVAL

THIS DRAWING AND THE INFORMATION CONTAINED HEREIN ARE PRELIMINARY FOR APPROVAL. IT CAN BE CHANGED IN THE EXECUTION STAGE. THIS DRAWING IS THE PROPERTY OF DOOSAN HEAVY INDUSTRIES & CONSTRUCTION CO., LTD. IT IS NOT TO BE COPIED OR USED IN ANY WAY DETRIMENTAL TO THE COMPANY.

OB	20.MAY.2022	Second issue	WANG X.H.	ZHANG J.Q.	LI W.G. LIU Y.Z.
OA	28.JUL.2021	First issue	ZHANG J.Q.	WANG H.Q.	LI W.G. LIU Y.Z.
REV. NO.	DATE	DESCRIPTION	DRAWN	CHKD.	APPD.

PROJECT TITLE

Upper Trishuli-1 HEP (216MW)

OWNER
NWEDC
NORMAL WATER AND ENERGY DEVELOPMENT CO., LTD.

OWNER'S ENGINEER
TRACTEBEL
ENGIE
jade CONSULT

CONTRACTOR
DOOSAN Enerbility

DRAWING TITLE

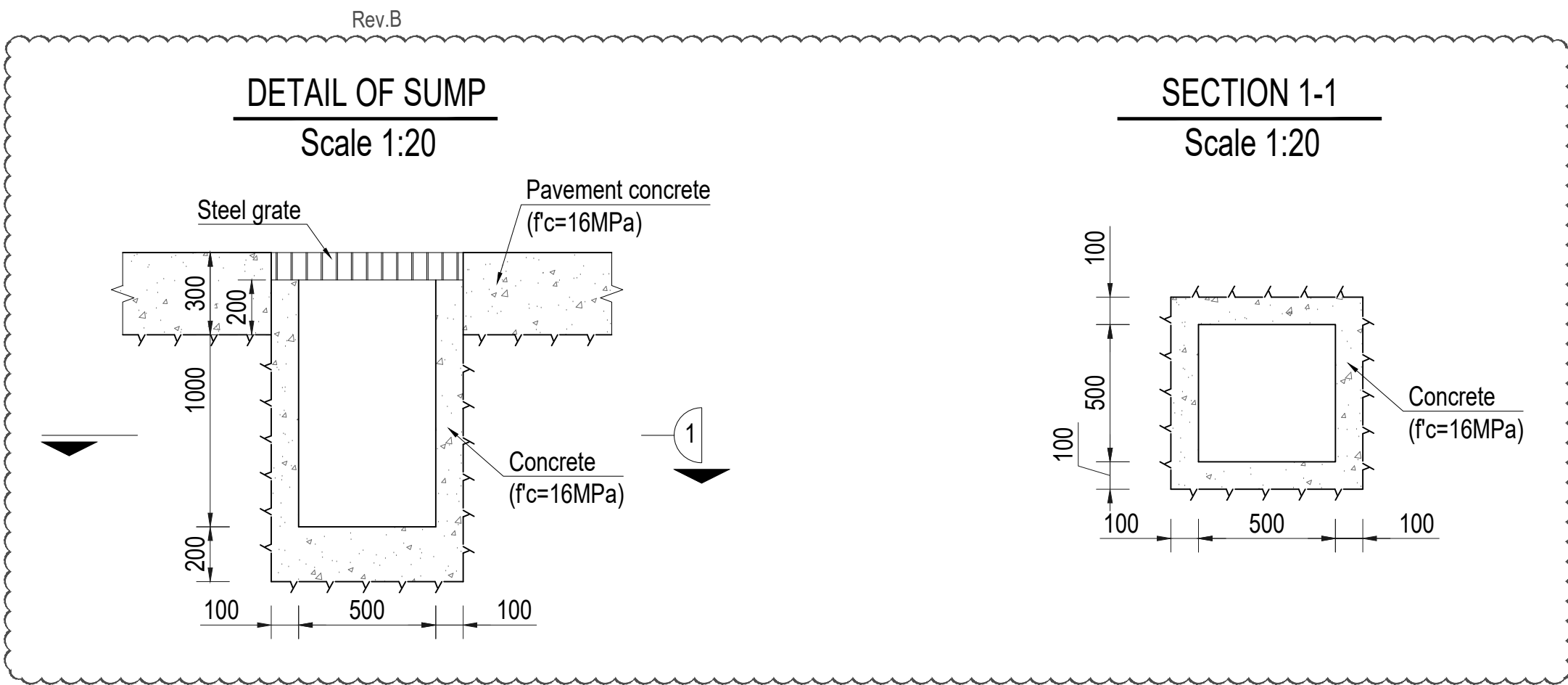
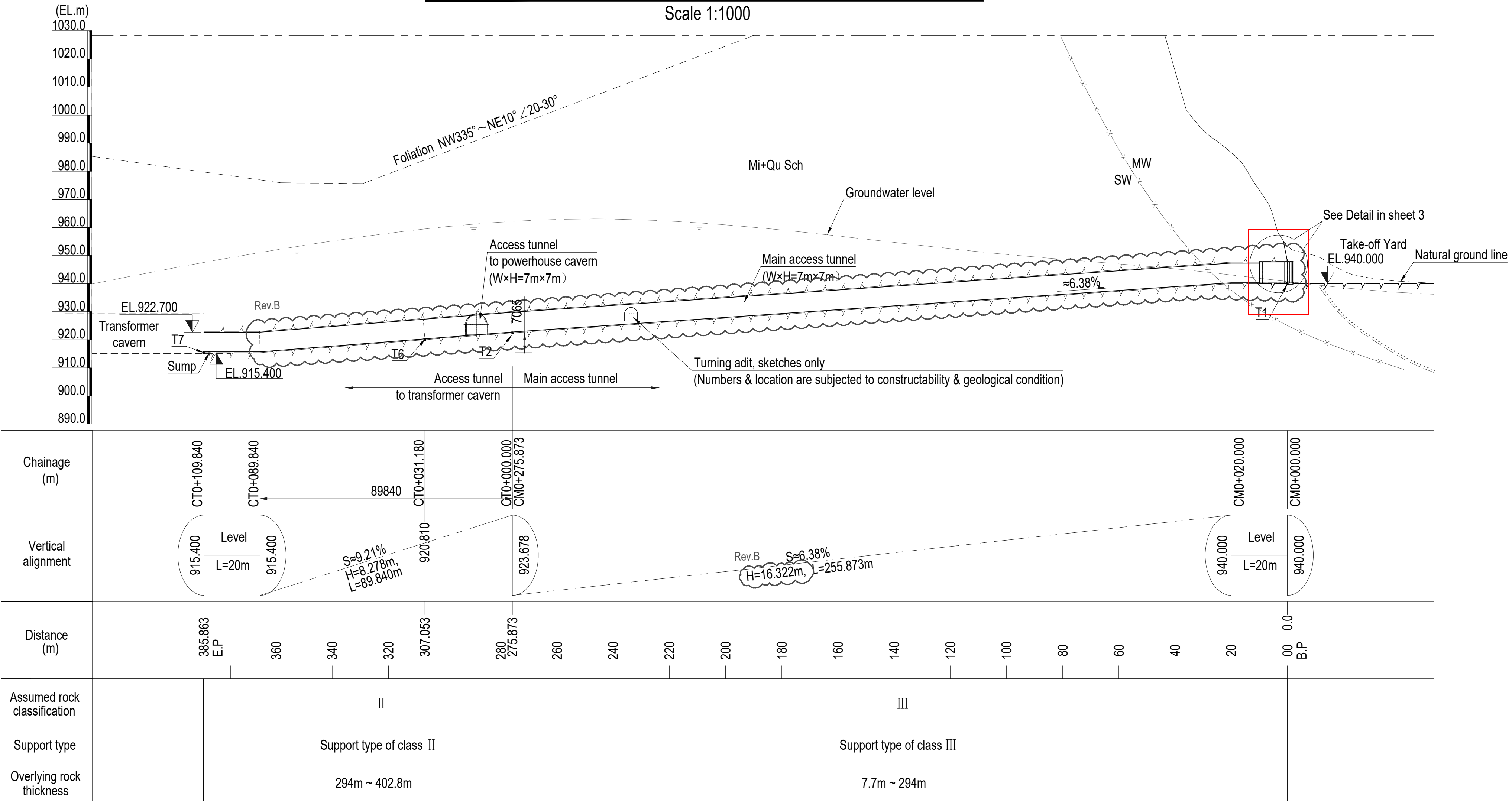
EXCAVATION AND SUPPORT OF ACCESS TUNNEL TO POWERHOUSE (1 / 6)

INDEX	DRAWING NUMBER	SHEET NO.	REV. NO.
A	UT1-C-090-CVL-DG-64002- 01	1 OF 6	0B

A1 (594 x 841 MM) 1

LONGITUDINAL PROFILE OF ACCESS TUNNEL (TO TRANSFORMER CAVERN)

Scale 1:1000



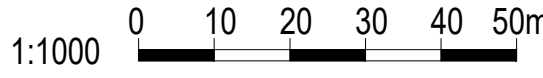
NOTE

1. All dimensions are in millimeters, and coordinates, chainages & elevations are in meters.

LEGEND:

- SW Inferred boundry between moderately weathered and slight weathered
- MW Excavation line

Scale:



REFERENCE DRAWINGS

UT1-C-090-CVL-DG-40001	DETAILED DESIGN DRAWING OF EXCAVATION AND SUPPORT FOR UNDERGROUND CAVERN
UT1-C-090-CVL-DG-64001	SURROUNDING ROCK STABILITY CALCULATION OF ACCESS TUNNEL FOR POWERHOUSE
UT1-C-090-CVL-DG-64001	LAYOUT OF ACCESS TUNNEL TO POWERHOUSE

SYMBOL AND LEGEND

FOR APPROVAL

THIS DRAWING AND THE INFORMATION CONTAINED HEREIN ARE PRELIMINARY FOR APPROVAL. IT CAN BE CHANGED IN THE EXECUTION STAGE. THIS DRAWING IS THE PROPERTY OF DOOSAN HEAVY INDUSTRIES & CONSTRUCTION CO., LTD. IT IS NOT TO BE COPIED OR USED IN ANY WAY DETRIMENTAL TO THE COMPANY.

REV. NO.	DATE	DESCRIPTION	DRAWN	CHKD.	APPD.
0B	20.MAY.2022	Second issue	WANG X.H.	ZHANG J.Q.	LI W.G.
0A	28.JUL.2021	First issue	ZHANG J.Q.	WANG H.Q.	LI W.G.

PROJECT TITLE

Upper Trishuli-1 HEP (216MW)

OWNER



OWNER'S ENGINEER



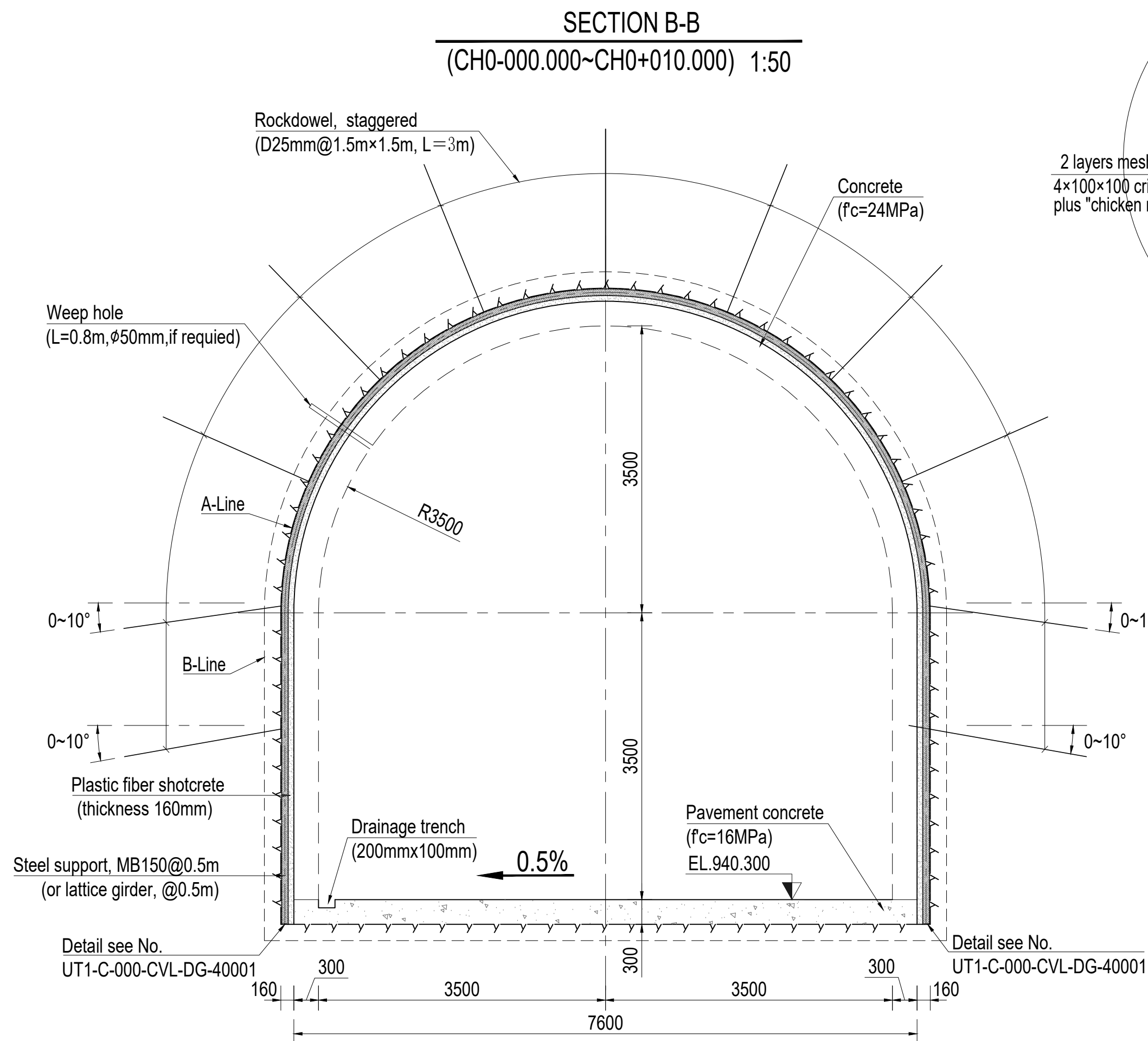
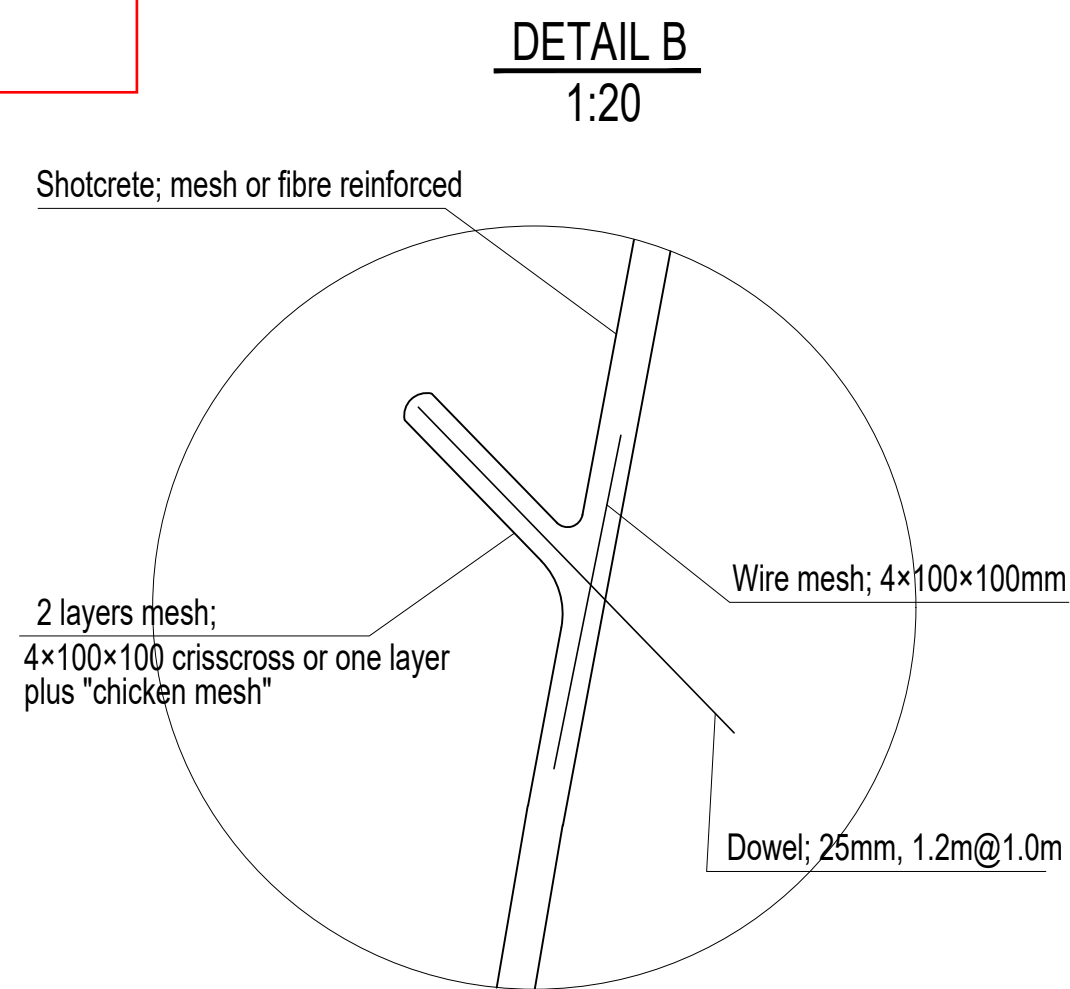
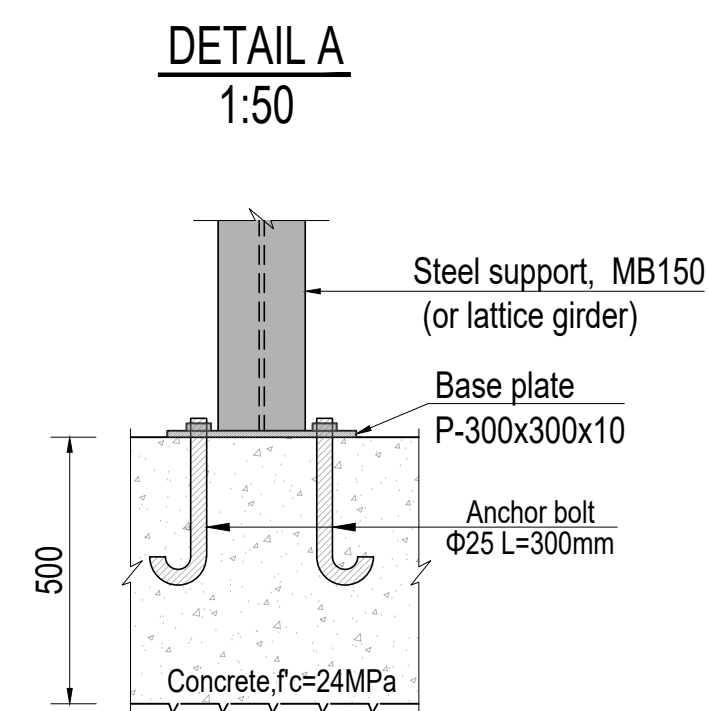
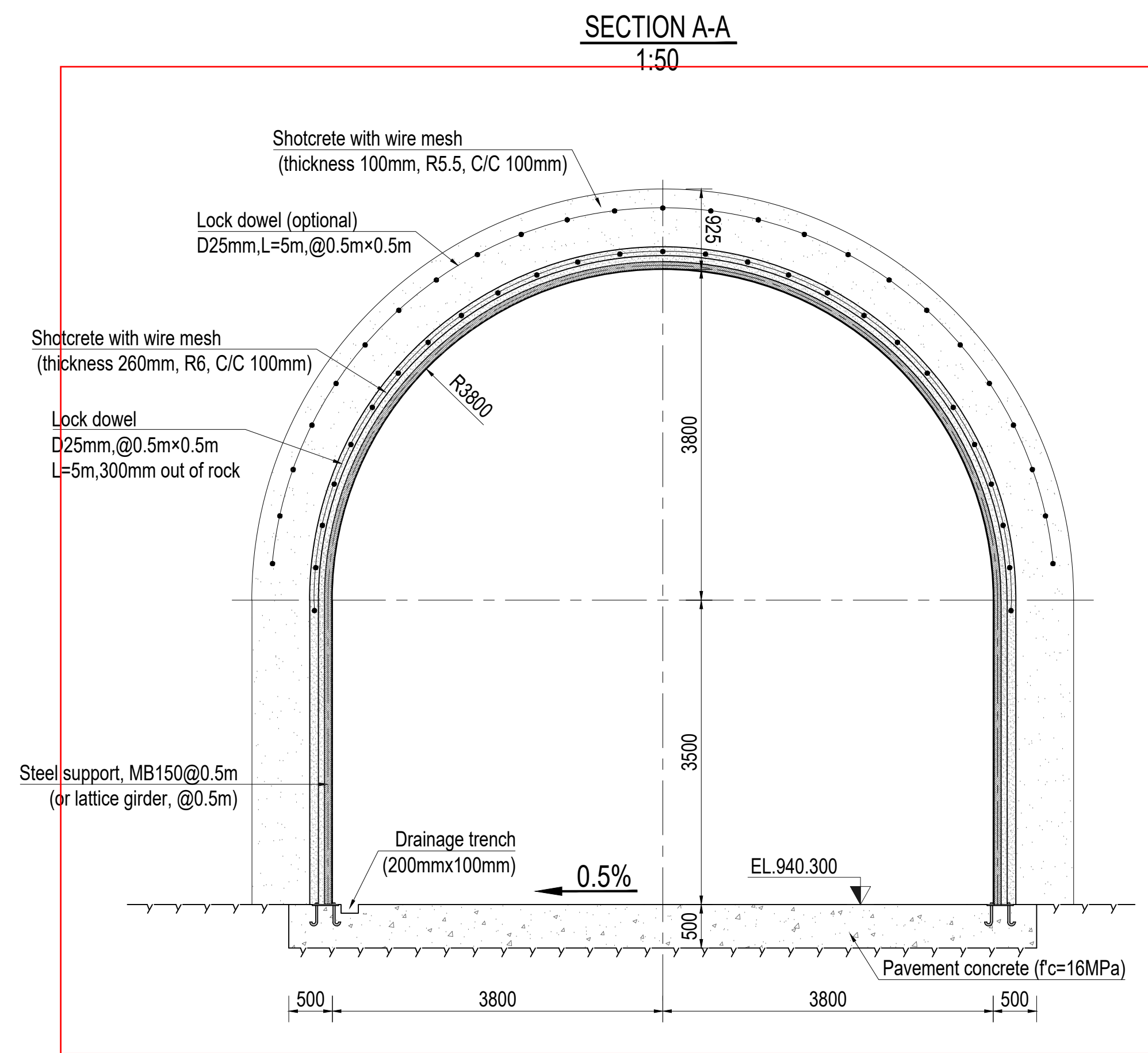
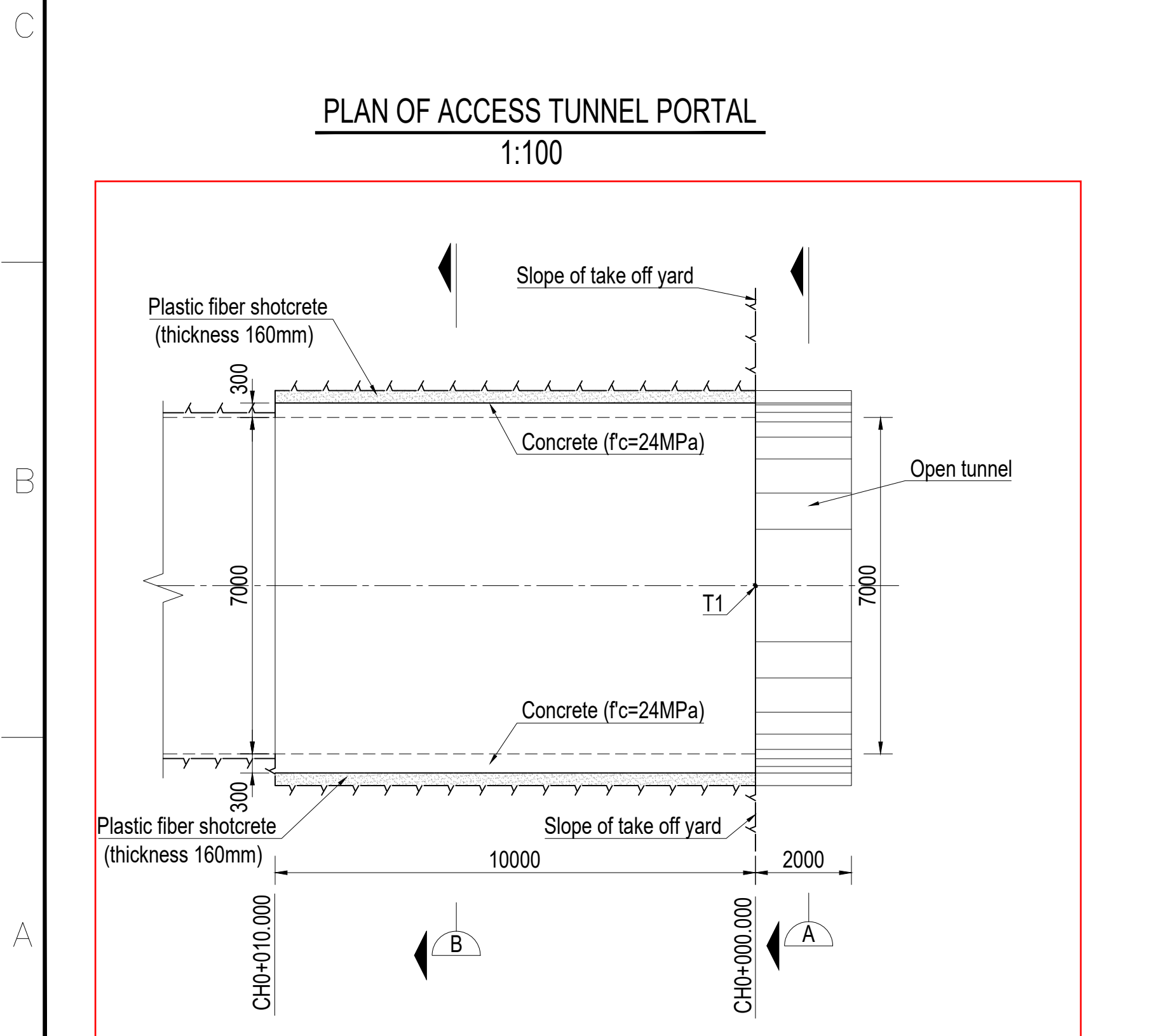
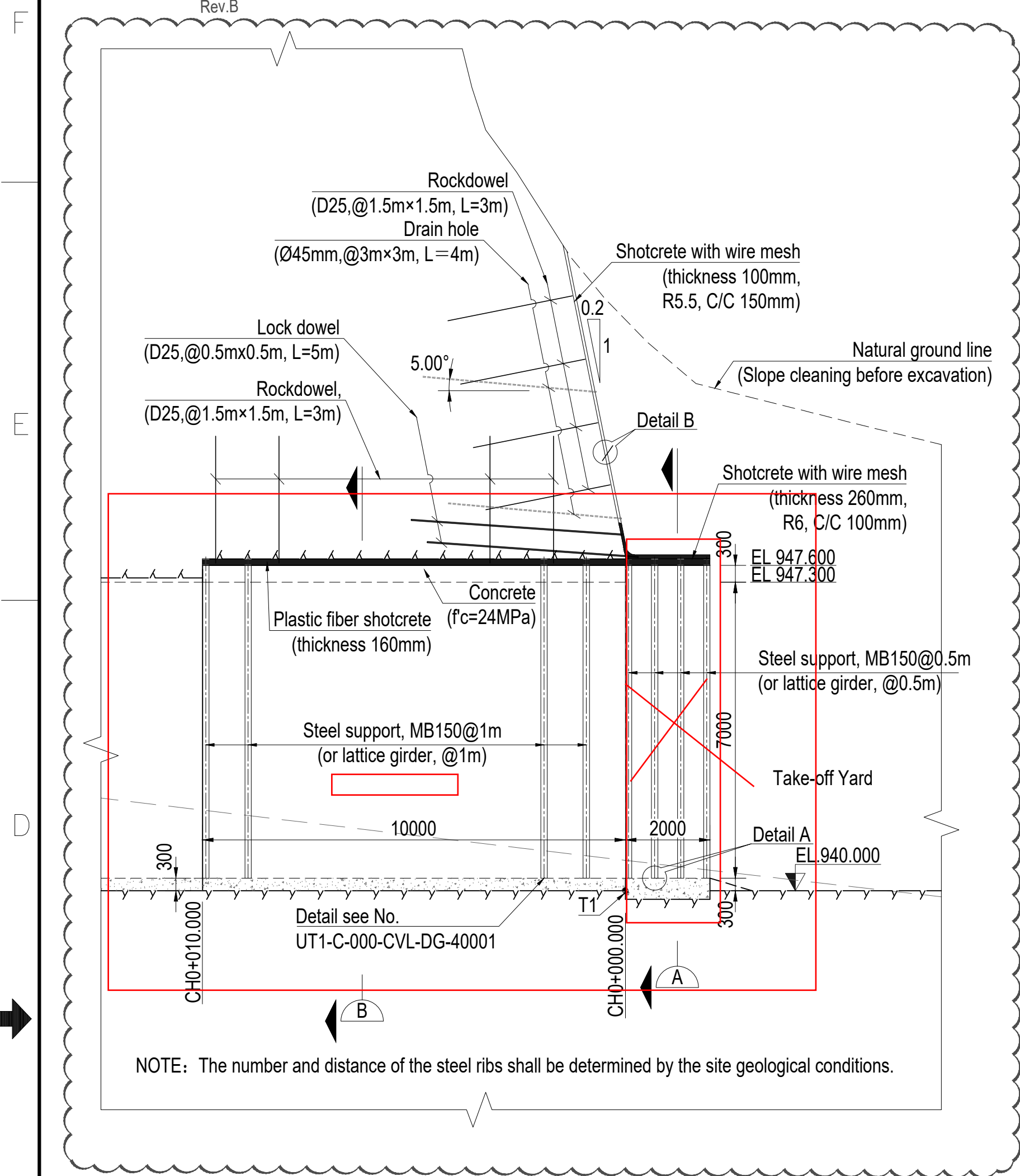
CONTRACTOR



DRAWING TITLE

EXCAVATION AND SUPPORT OF ACCESS TUNNEL TO POWERHOUSE (2 / 6)

INDEX	DRAWING NUMBER	SHEET NO.	REV. NO.
A	UT1-C-090-CVL-DG-64002- 02	2 OF 6	0B



NOTE

1. All dimensions are in millimeters, and coordinates, chainages & elevations are in meters.

Legend:

Section of concrete

Scale:

1:50 0 0.5 1.0 1.5 2.0 2.5m

1:100 0 1 2 3 4 5m

REFERENCE DRAWINGS

NO.	REVISION	DATE	DESCRIPTION	DRAWN	CHKD.	APPD.
0B	20.MAY.2022	Second issue	WANG X.H.	ZHANG J.Q.	LIU Y.Z.	
0A	28.JUL.2021	First issue	ZHANG J.Q.	WANG H.Q.	LIU Y.Z.	

SYMBOL AND LEGEND

FOR APPROVAL

THIS DRAWING AND THE INFORMATION CONTAINED HEREIN ARE PRELIMINARY FOR APPROVAL. IT CAN BE CHANGED IN THE EXECUTION STAGE. THIS DRAWING IS THE PROPERTY OF DOOSAN HEAVY INDUSTRIES & CONSTRUCTION CO., LTD. IT IS NOT TO BE COPIED OR USED IN ANY WAY DETRIMENTAL TO THE COMPANY.

PROJECT TITLE

Upper Trishuli-1 HEP (216MW)

OWNER

NWEDC
NEPAL WATER AND ENERGY DEVELOPMENT CO. (PVT.) LTD.

OWNER'S ENGINEER

TRACTEBEL
ENGINTE

jade
CONSULT

CONTRACTOR

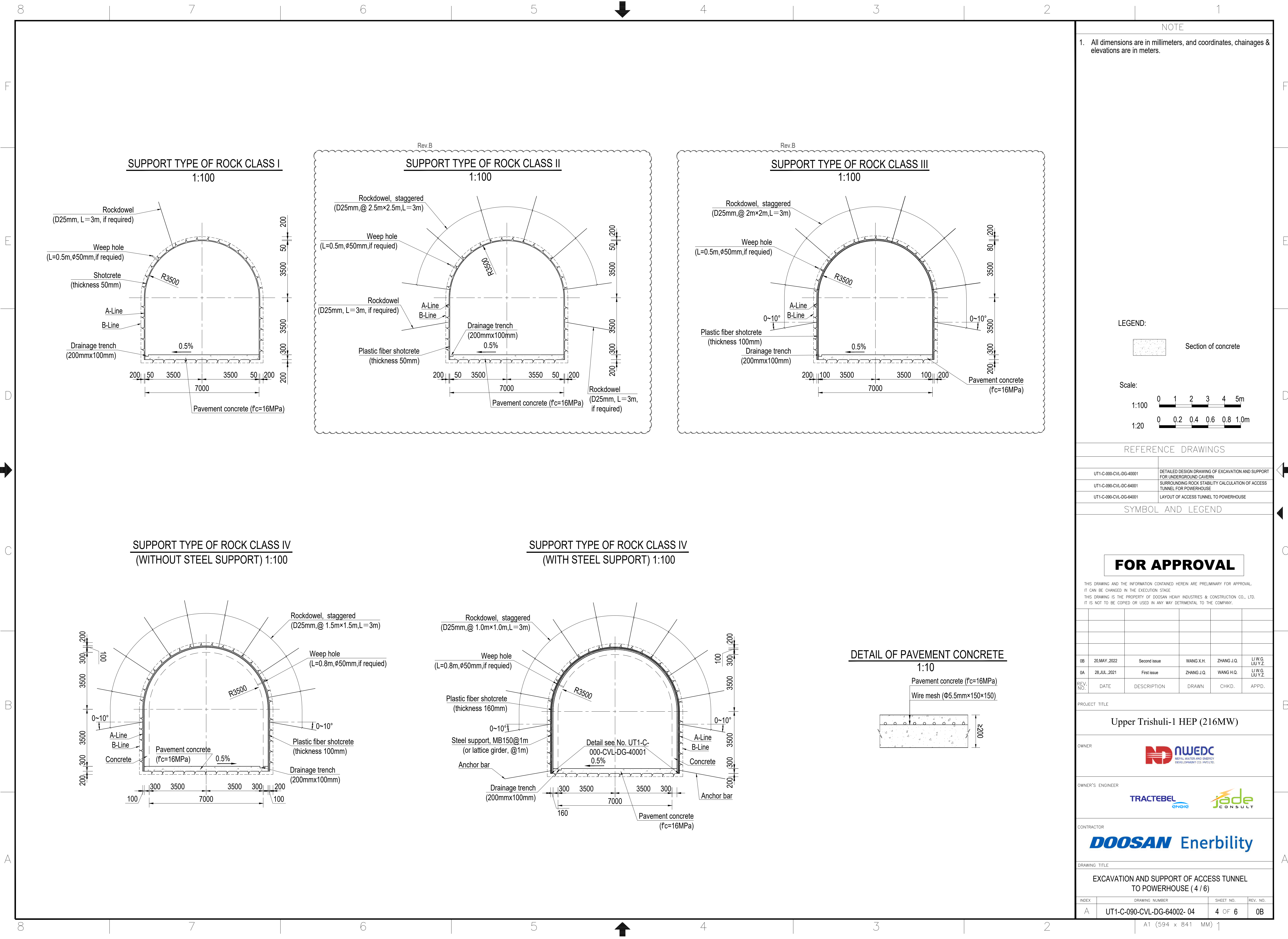
DOOSAN Enerbility

DRAWING TITLE

EXCAVATION AND SUPPORT OF ACCESS TUNNEL TO POWERHOUSE (3 / 6)

INDEX	DRAWING NUMBER	SHEET NO.	REV. NO.
A	UT1-C-090-CVL-DG-64002- 03	3 OF 6	0B

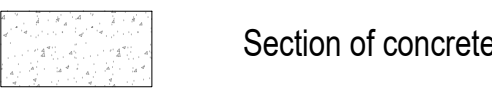
A1 (594 x 841 MM)



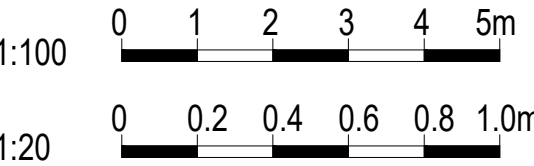
NOTE

1. All dimensions are in millimeters, and coordinates, chainages & elevations are in meters.

LEGEND:



Scale:



REFERENCE DRAWINGS

UT1-C-000-CVL-DG-40001	DETAILED DESIGN DRAWING OF EXCAVATION AND SUPPORT FOR UNDERGROUND CAVERN
UT1-C-090-CVL-DG-64001	SURROUNDING ROCK STABILITY CALCULATION OF ACCESS TUNNEL FOR POWERHOUSE
UT1-C-090-CVL-DG-64001	LAYOUT OF ACCESS TUNNEL TO POWERHOUSE

SYMBOL AND LEGEND

FOR APPROVAL

THIS DRAWING AND THE INFORMATION CONTAINED HEREIN ARE PRELIMINARY FOR APPROVAL. IT CAN BE CHANGED IN THE EXECUTION STAGE. THIS DRAWING IS THE PROPERTY OF DOOSAN HEAVY INDUSTRIES & CONSTRUCTION CO., LTD. IT IS NOT TO BE COPIED OR USED IN ANY WAY DETRIMENTAL TO THE COMPANY.

REV. NO.	DATE	DESCRIPTION	DRAWN	CHKD.	APPD.
0B	20.MAY.2022	Second issue	WANG X.H.	ZHANG J.Q.	LIU W.G.
0A	28.JUL.2021	First issue	ZHANG J.Q.	WANG H.Q.	LIU W.G.

PROJECT TITLE

Upper Trishuli-1 HEP (216MW)

OWNER



OWNER'S ENGINEER



CONTRACTOR

DOOSAN Enerbility

DRAWING TITLE

EXCAVATION AND SUPPORT OF ACCESS TUNNEL TO POWERHOUSE (4 / 6)

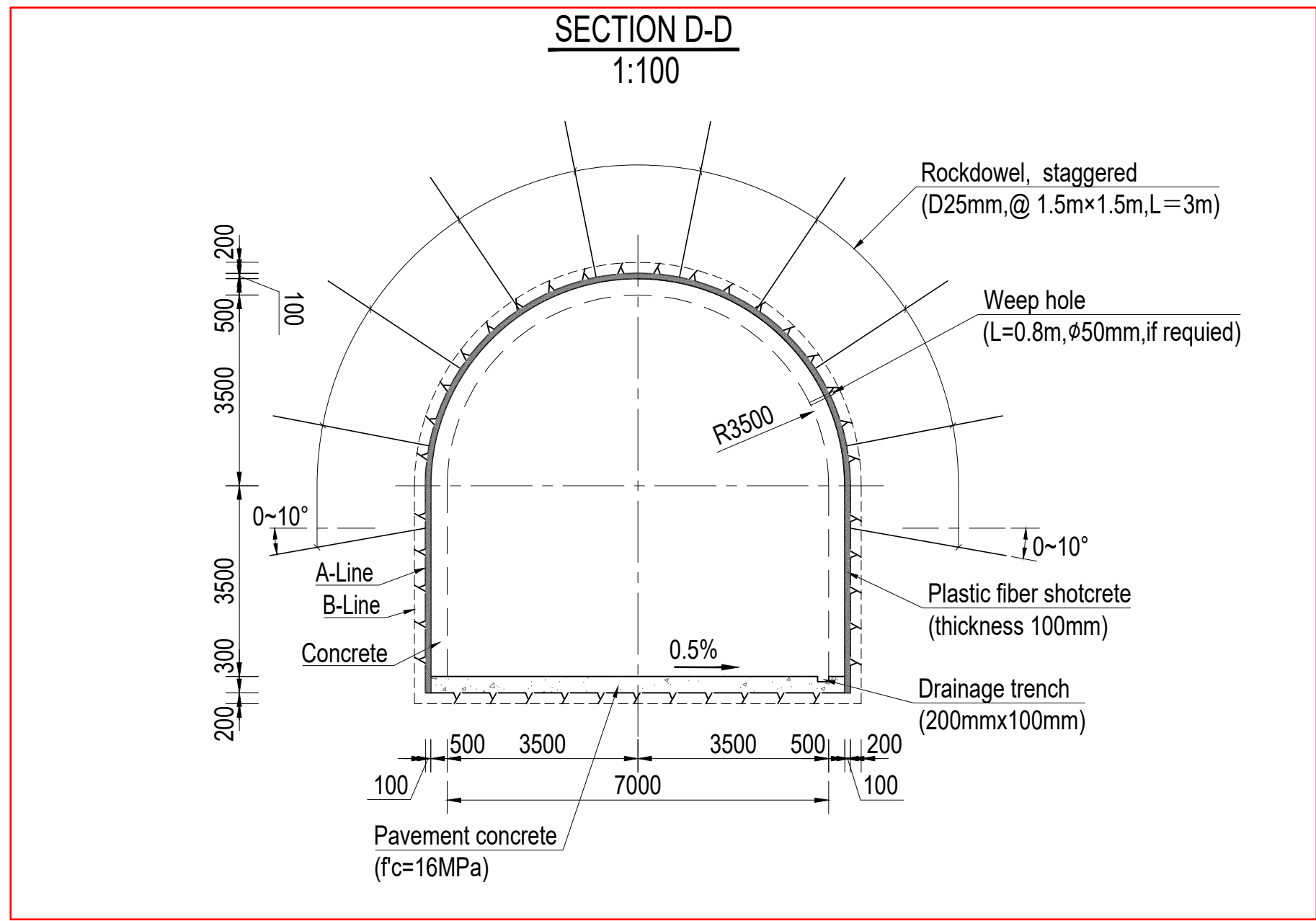
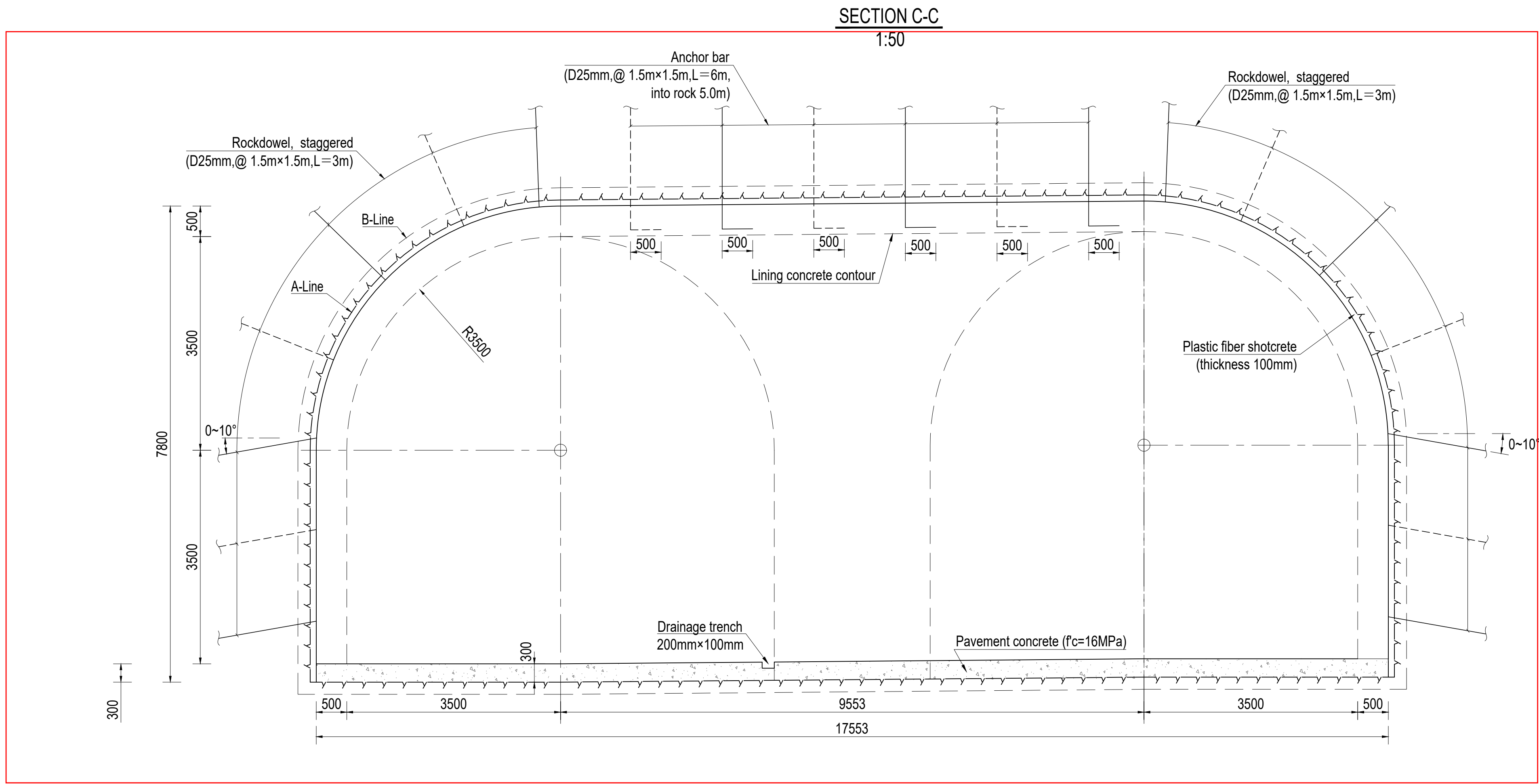
INDEX	DRAWING NUMBER	SHEET NO.	REV. NO.
A	UT1-C-090-CVL-DG-64002- 04	4 OF 6	0B

A1 (594 x 841 MM) 1

1:50

1:50

millimeters, and coordinates, chainages & elevations.



SAFETY INSTRUCTION:

1. THE WORKERS WHO EQUIPPED WITH THE NECESSARY SAFETY PROTECTION MEASURES SHOULD BE FAMILIAR WITH AND COMPLY WITH THE SAFETY RULES FOR CONSTRUCTION, AND MUST ADHERE THE "SAFETY FIRST, PREVENTION FIRST, COMPREHENSIVE MANAGEMENT" APPROACH, TO ENSURE SAFETY ON SITE ;
2. IT 'S FIRST THAT CHECKING THE PROCESSING EQUIPMENT IS NORMAL OPERATION OR NOT, FOR THE PRODUCTION AND THE PERSONAL SAFETY DURING STEEL PROCESSING ,THE OPERATOR SHOULD STRICTLY ABIDE BY THE SCHEDULED OPERATION PROCEDURES ;
3. IT'S REQUIREMENT THAT WELDING MACHINES ARE RELIABLE TO CONNECT GROUND, AND INSULATED CABLES ARE EQUIPPED WITH LEAKAGE PROTECTOR; IT IS STRICTLY PROHIBITED TO THE OPERATION, AND SHOULD WEAR PROTECTIVE GLASSES AND OTHER NECESSARY PROTECTIVE EQUIPMENT DURING STEEL INSTALLING;
4. SECURITY WARNING SIGNS SHOULD BE SET WHEN STEEL LIFTING, THE TEMPORARY LOCATION AND ANTI DUMPING SUPPORT SHOULD BE SAFE AND RELIABLE, SCAFFOLDING, CONSTRUCTION PLATFORM AND CHANNEL SHOULD BE BINDING ;
5. THE WORKERS SHOULD PAY ATTENTION TO THE EXISTENCE UNSAFE AREAS IN THE COURSE OF CONSTRUCTION , AND TAKE PREVENTIVE MEASURES IN TIME.

NOTE

1. All dimensions are in millimeters, and coordinates, chainages & elevations are in meters.

REFERENCE DRAWINGS

UT1-C-090-CVL-DG-40001	DETAILED DESIGN DRAWING OF EXCAVATION AND SUPPORT FOR UNDERGROUND CAVERN
UT1-C-090-CVL-DG-64001	SURROUNDING ROCK STABILITY CALCULATION OF ACCESS TUNNEL FOR POWERHOUSE
UT1-C-090-CVL-DG-64001	LAYOUT OF ACCESS TUNNEL TO POWERHOUSE

SYMBOL AND LEGEND

FOR APPROVAL

THIS DRAWING AND THE INFORMATION CONTAINED HEREIN ARE PRELIMINARY FOR APPROVAL. IT CAN BE CHANGED IN THE EXECUTION STAGE. THIS DRAWING IS THE PROPERTY OF DOOSAN HEAVY INDUSTRIES & CONSTRUCTION CO., LTD. IT IS NOT TO BE COPIED OR USED IN ANY WAY DETRIMENTAL TO THE COMPANY.

REV. NO.	DATE	DESCRIPTION	DRAWN	CHKD.	APPD.
0B	20.MAY.2022	Second issue	WANG X.H.	ZHANG J.Q.	LI W.G.
0A	28.JUL.2021	First issue	ZHANG J.Q.	WANG H.Q.	LI W.G.

PROJECT TITLE

Upper Trishuli-1 HEP (216MW)

OWNER



OWNER'S ENGINEER



CONTRACTOR

DOOSAN Enerbility

DRAWING TITLE

EXCAVATION AND SUPPORT OF ACCESS TUNNEL TO POWERHOUSE (6 / 6)

INDEX	DRAWING NUMBER	SHEET NO.	REV. NO.
A	UT1-C-090-CVL-DG-64002- 06	6 OF 6	0B

A1 (594 x 841 MM) 1